(12) UK Patent Application (19) GB (11) 2 333 017 (13) A

(43) Date of A Publication 07.07.1999

(21) Application No 9823408.1

(22) Date of Filing 26.10.1998

(30) Priority Data
(31) 9754808 (32) 24.10.1997 (33) KR
(31) 9763047 (32) 26.11.1997

(51) INT CL[6]
H04N 5/00

(52) UK CL (Edition Q)
H4P PPS

(56) Documents Cited
EP 0782332 A2 EP 0751680 A2 WO 97/46009 A1
US 5675654 A

(58) Field of Search
UK CL (Edition Q) H4P PDRX PPS
INT CL[6] H04J 3/24, H04L 5/02 12/56, H04N 5/00 7/60 7/62
ONLINE : EPODOC, WPI, JAPIO

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(54) System for recording/reproducing MPEG-2 broadcasting programs

(57) An apparatus for reproducing and recording programs encoded according to MPEG-2 system standard into and from a recording media includes a recording apparatus for recording a transport stream of the same MPEG-2 broadcasting program and a demultiplexer for demultiplexing a transport stream according to a video PID and an audio PID. Video and audio bitstreams outputted from the demultiplexer are decoded by a MPEG decoder. The demultiplexer demuliplexes the transport stream read out from the recording apparatus according to a video PID and an audio PID, each of which is provided from a microcomputer. The microcomputer detects the video and audio PIDs from the transport packets of the transport stream based on whether the MPEG decoder detects a sequence header included in the transport packets or not. Therefore, the apparatus can decode the transport stream reproduced from the recording apparatus without the information about the video and audio PIDs of the transport packets which are recorded in the recording apparatus.

FIG. 1

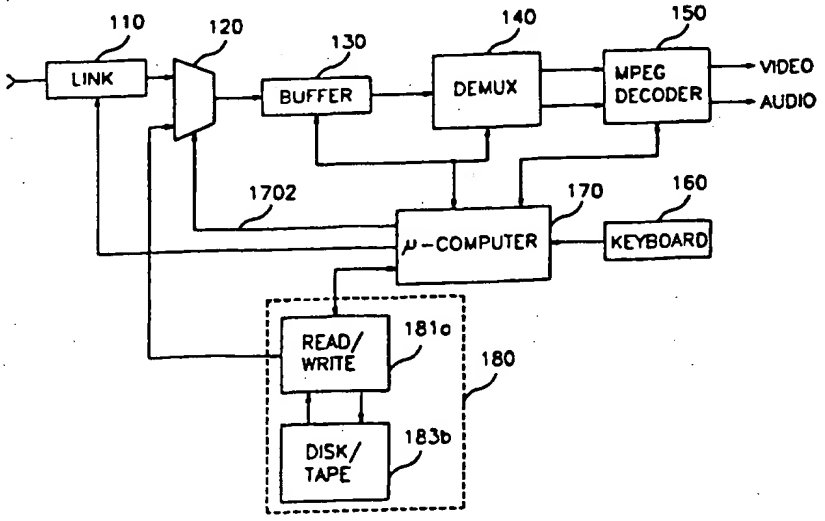

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FIG. 1

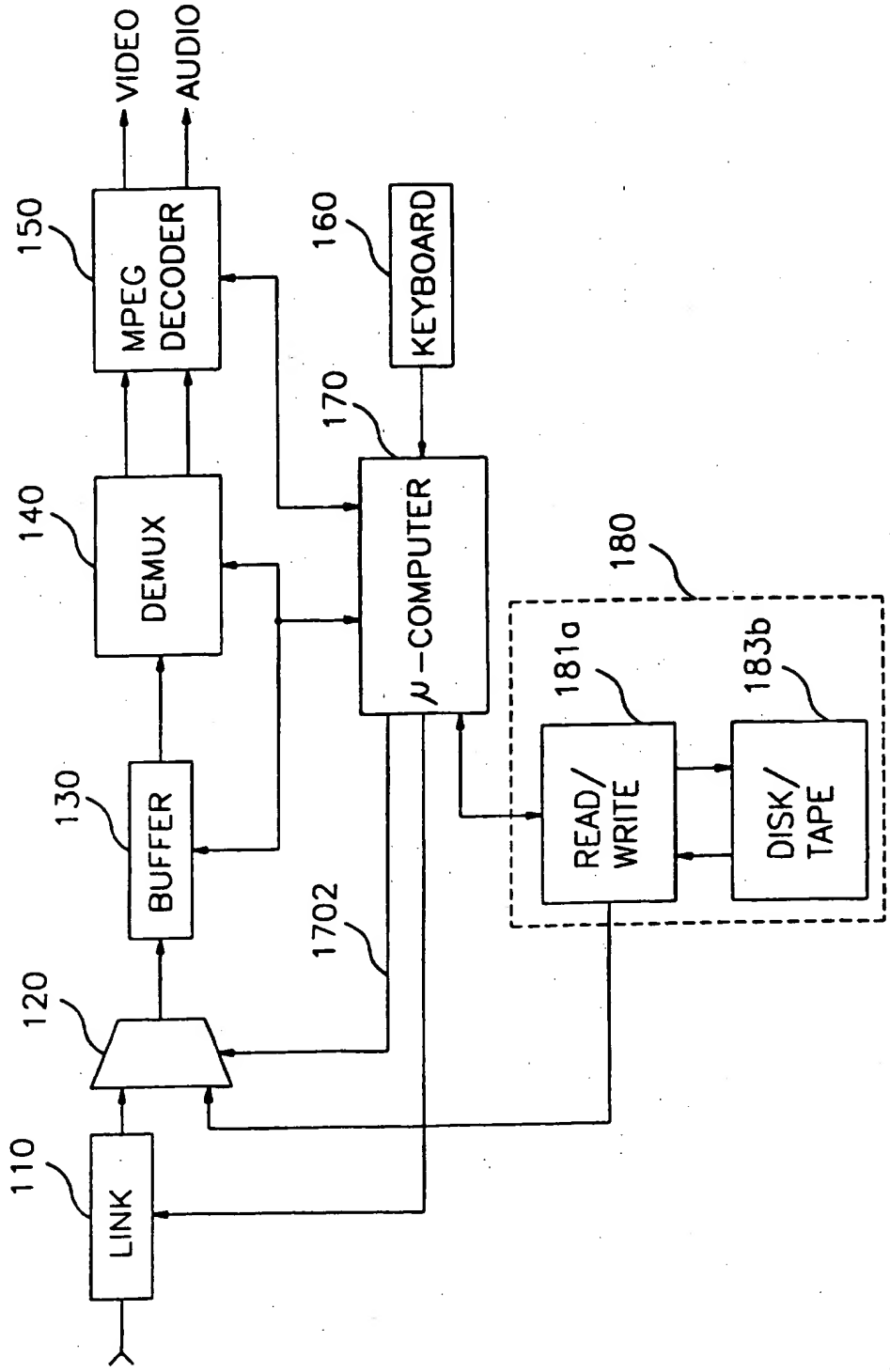

VIDEO
AUDIO
150
MPEG DECODER
160
KEYBOARD
170
140
DEMUX
μ-COMPUTER
180
181a
183b
130
BUFFER
READ/ WRITE
DISK/ TAPE
1702
120
110
LINK

FIG.2

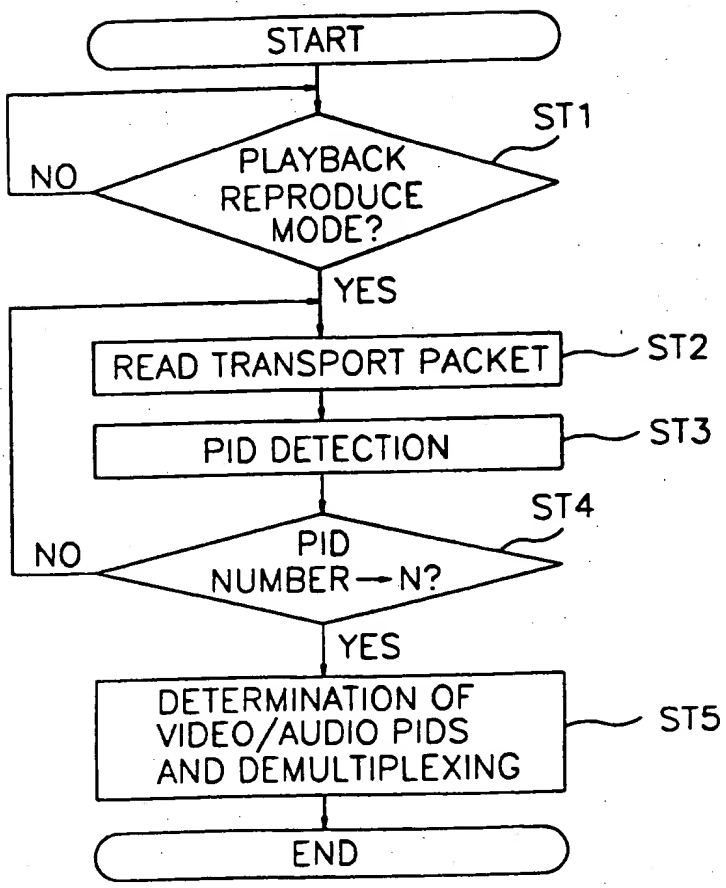

START
ST1
PLAYBACK REPRODUCE MODE?
NO
YES
READ TRANSPORT PACKET
ST2
PID DETECTION
ST3
ST4
PID NUMBER → N?
NO
YES
DETERMINATION OF VIDEO/AUDIO PIDS AND DEMULTIPLEXING
ST5
END

FIG.3

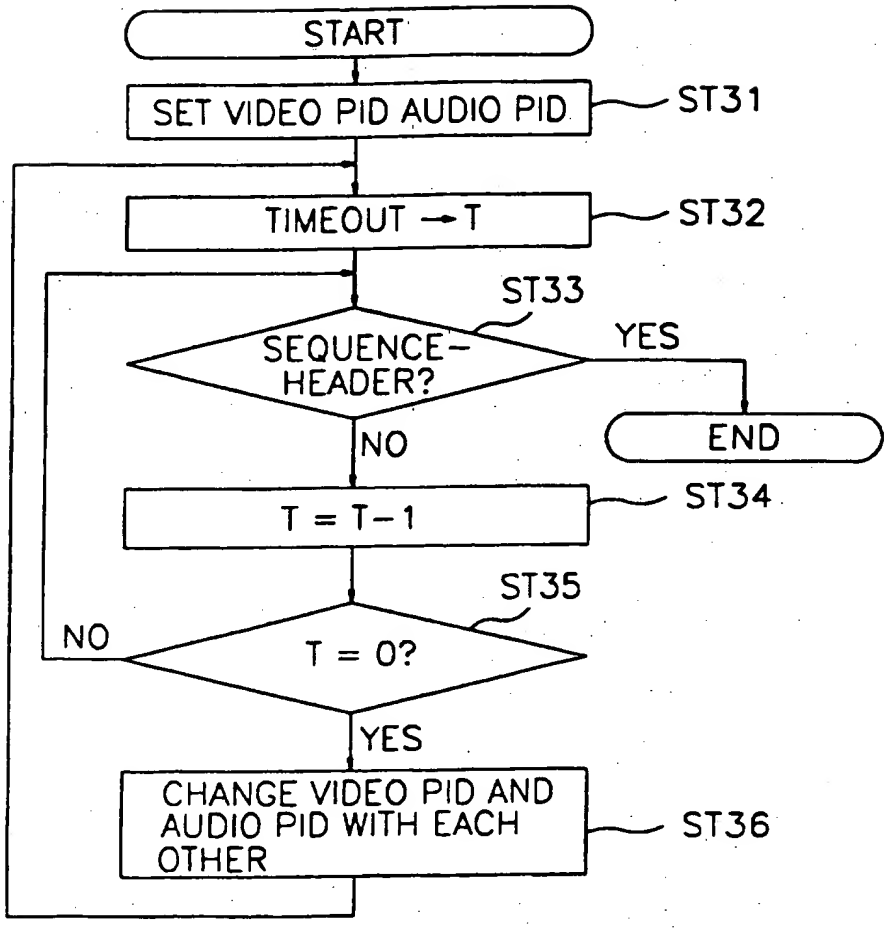

START
SET VIDEO PID AUDIO PID
ST31
TIMEOUT → T
ST32
ST33
SEQUENCE-HEADER?
YES
END
NO
T = T-1
ST34
ST35
NO
T = 0?
YES
CHANGE VIDEO PID AND AUDIO PID WITH EACH OTHER
ST36

FIG.4

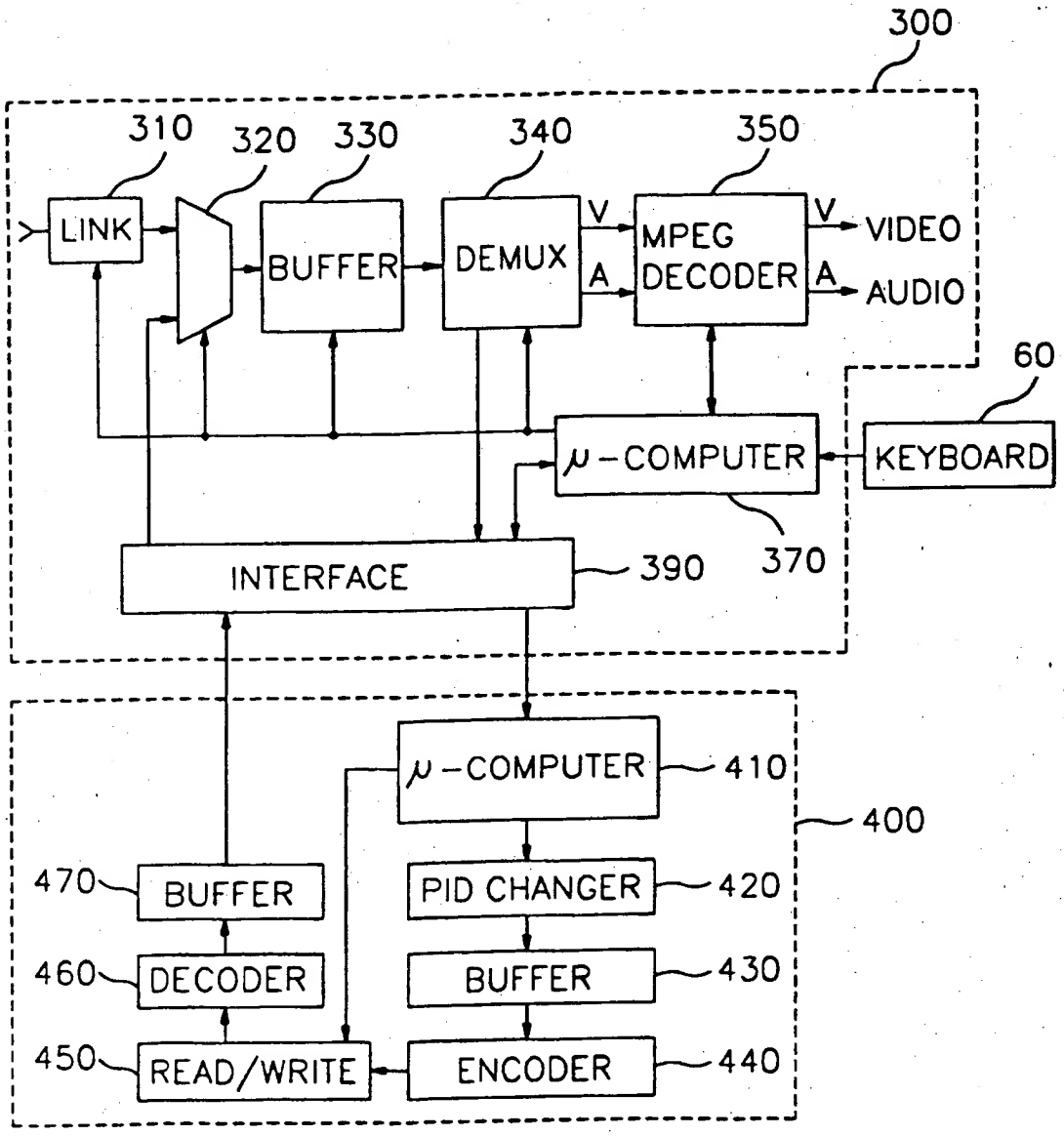

300
310
320
330
340
350
LINK
BUFFER
DEMUX
V
A
MPEG DECODER
V
A
VIDEO
AUDIO
60
KEYBOARD
μ-COMPUTER
370
INTERFACE
390
μ-COMPUTER
410
400
470
BUFFER
PID CHANGER
420
460
DECODER
BUFFER
430
450
READ/WRITE
ENCODER
440

FIG.5

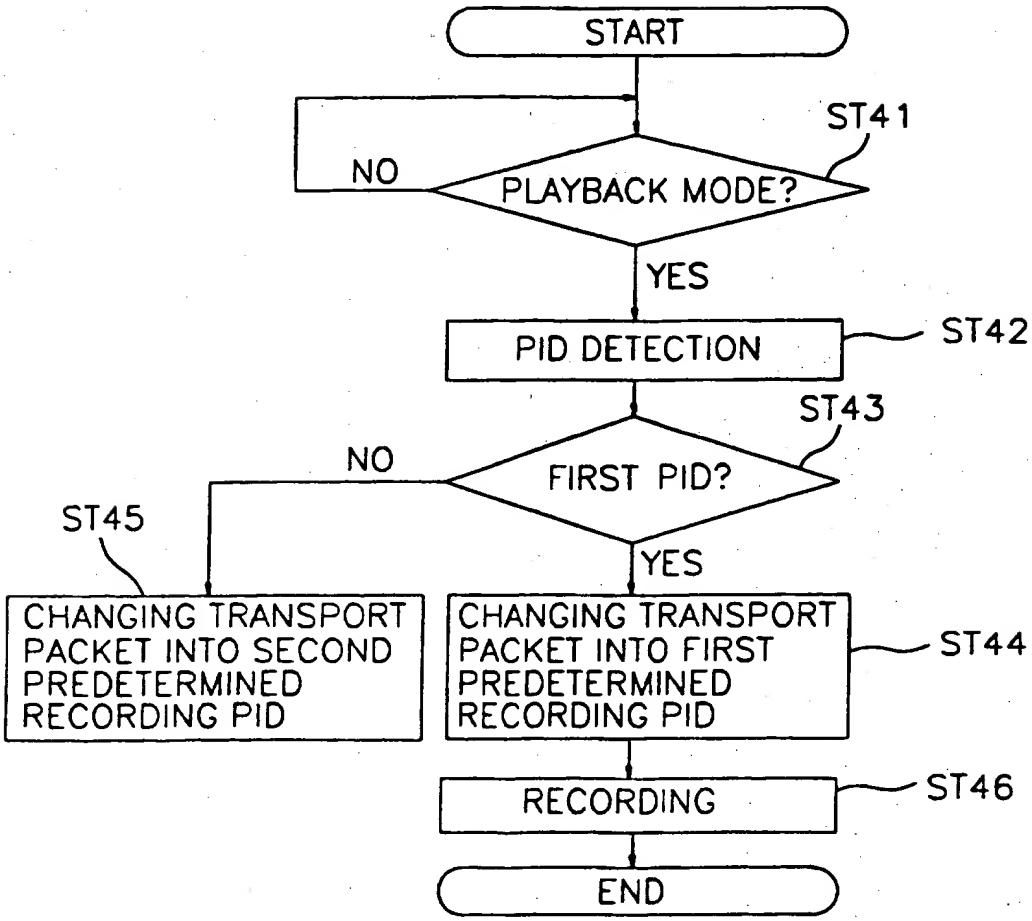

START
ST41
NO
PLAYBACK MODE?
YES
PID DETECTION
ST42
ST43
NO
FIRST PID?
ST45
YES
CHANGING TRANSPORT PACKET INTO SECOND PREDETERMINED RECORDING PID
CHANGING TRANSPORT PACKET INTO FIRST PREDETERMINED RECORDING PID
ST44
RECORDING
ST46
END

FIG.6

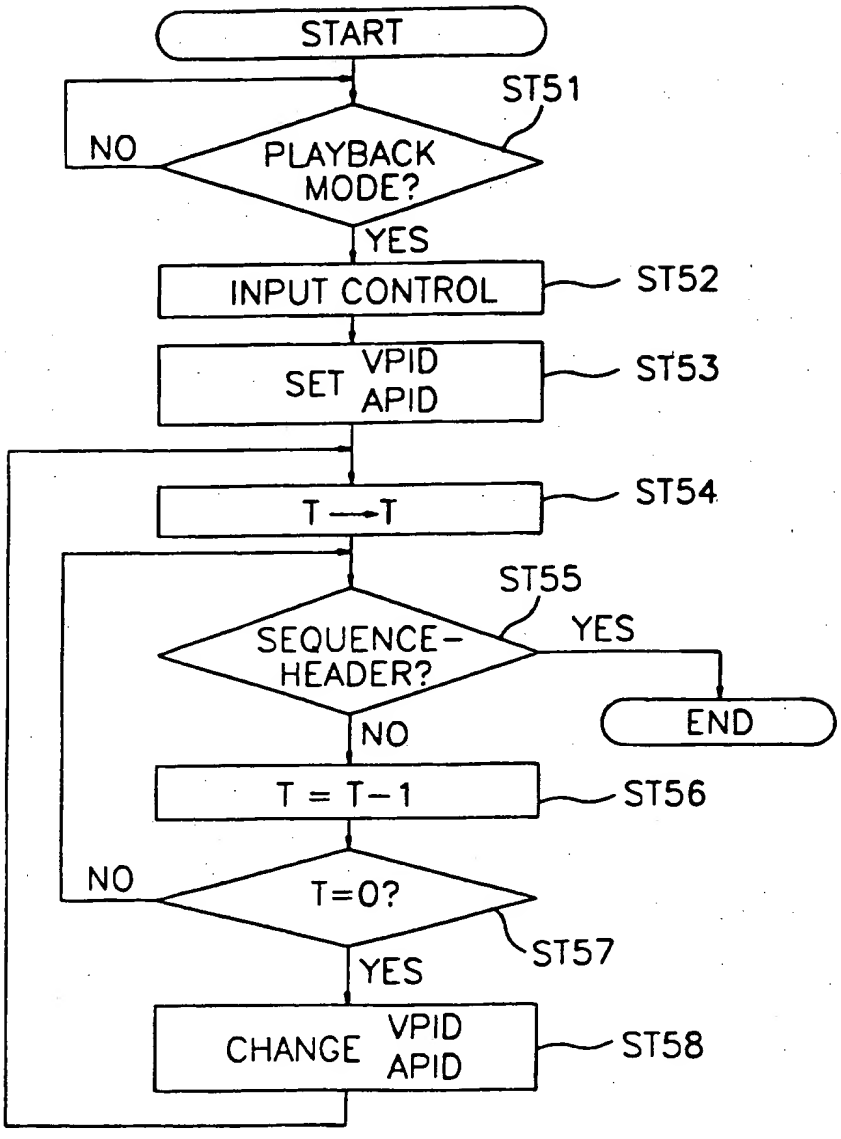
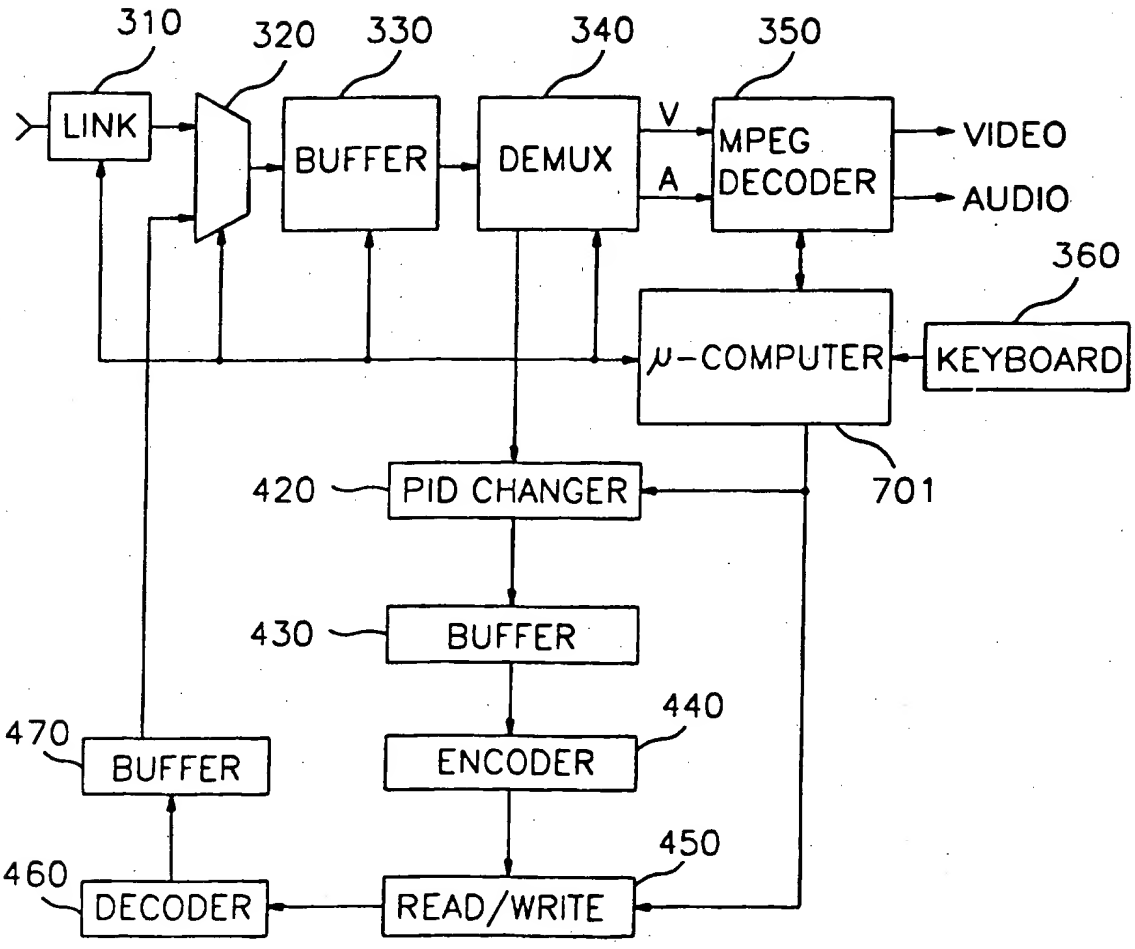

START
ST51
NO
PLAYBACK MODE?
YES
INPUT CONTROL
ST52
SET VPID APID
ST53
T → T
ST54
ST55
SEQUENCE-HEADER?
YES
END
NO
T = T−1
ST56
NO
T=0?
ST57
YES
CHANGE VPID APID
ST58

FIG.7


310
320
330
340
350
LINK
BUFFER
DEMUX
V
A
MPEG DECODER
VIDEO
AUDIO
360
μ-COMPUTER
KEYBOARD
701
420
PID CHANGER
430
BUFFER
440
ENCODER
470
BUFFER
450
460
DECODER
READ/WRITE

SYSTEM FOR RECORDING/REPRODUCING MPEG-2 BROADCASTING PROGRAMS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an apparatus for reproducing and recording programs encoded according to MPEG-2 system standard into and from a recording media and a method thereof.

2. Prior Art

The MPEG-2 system standard, ISO/IEC 13818-1, which is hereby incorporated by reference for its teachings on MPEG-2 encoding, defines a method of formatting and transmitting multiple digitally encoded programs, each including a video portion, an audio portion and a data portion. According to this standard, data representing multiple programs may be transmitted as a single time-division multiplexed transport stream.

The basic unit of the transport stream is a transport packet. Each transport packet has a fixed length(i.e., 188 bytes) and includes a header portion and a data portion. When the data portions of several transport packets are combined, a packetized elementary stream(PES) packet is formed. Each PES packet may represent part of the video information, the audio

information, or the data which together constitute the program. The transport packets representing PES packets for different programs may be interleaved. Thus, the multiple programs may be sent in a time-division multiplexed format. In addition, the transport stream includes some system packets which do not belong to any program but which are used to associate the transport packets with their respective programs.

Transport streams containing multiple programs are already in use, for example, by the direct broadcast satellite(DBS) system. In this system, several programs, each representing, for example, programming that would be sent on a conventional terrestrial broadcast channel, are combined in a single transport stream and transmitted over a transponder channel. The satellite service consists of several transponder channels. And, at the DBS receiver which is called a Set Top Box, a particular transport stream is selected and the transport packets corresponding to a particular program are demultiplexed. These packets are then provided to a decoder to reproduce the program or are decoded to recover an analog video signal or an analog audio signal which can be outputted on the conventional display such as a television receiver or the like.

For recording the transport packets of a particular program that are selected from a transport stream on a storage medium

such as a hard disk, a magnetic tape of a digital VCR or VHS or the like and reproducing the program from the storage medium, PIDs of the transport packets must be provided to a reproducing apparatus. However, the reproducing apparatus cannot reproduce the particular program since the reproducing apparatus has no PAT and PMT data concerned with the program.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an apparatus for recording and reproducing an MPEG-2 broadcasting program which can reproduce an MPEG-2 broadcasting program without any information of PAT and PMT and a method thereof.

In order to achieve the above objects, an apparatus according to one aspect of the present invention includes means for recording a transport stream of the same MPEG-2 broadcasting program; means for demultiplexing a transport stream according to a video PID and an audio PID; means for decoding a video bitstream and an audio bitstream according to a sequence header, the sequence header being detected from the video bitstream or the audio bitstream, each of which is generated from the demultiplexing means; and means for detecting PIDs from the transport stream read out from the recording means providing PIDs and providing the detected PIDs

as the video PID or the audio PID to the demultiplexing means in response to whether the decoding means detects the sequence header.

A method according to another aspect of the present invention includes the steps of a) reading out transport packets of a MPEG-2 broadcasting program from a storage medium in which the MPEG-2 broadcasting program is recorded, wherein transport packets are multiplexed by video transport packets and audio transport packets; b) demultiplexing the transport packets according to a video PID and an audio PID, thereby generating a video bitstream and an audio bitstream; c) decoding the video bitstream and the audio bitstream according to a sequence header, the sequence header which is included in the video bitstream or the audio bitstream; d) detecting one PID or more from the transport packets; and e) selecting the video PID and the audio PID from the one PID or more detected by step d) based on whether the sequence header is detected by step c).

According to the present invention, there are provided an apparatus and a method for recording and reproducing an MPEG-2 broadcasting program which can reproduce an MPEG-2 broadcasting program without any information of PAT and PMT.

BRIEF DESCRIPTION OF THE DRAWINGS

Examples of embodiments of the present invention will now be described with reference to the accompanying drawings, in which:

FIG. 1 is a block diagram for showing an apparatus for reproducing and recording MPEG-2 video/audio data according to one embodiment of the present invention;

FIGs. 2 and 3 are flow charts for illustrating an operation of the microcomputer depicted in FIG. 1;

FIG. 4 is a block diagram for showing an MPEG-2 video/audio recording and reproducing apparatus according to another embodiment of the present invention which is connected with a set top box;

FIG. 5 is a flow chart for illustrating an operation of the second microcomputer depicted in FIG. 4;

FIG. 6 is a flow chart for illustrating an operation of the first microcomputer depicted in FIG. 4; and

FIG. 7 is a block diagram for showing an apparatus for reproducing and recording MPEG-2 video/audio data according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Preferred embodiments of the present invention will be

illustrated below with reference to the accompanying drawings.

FIG. 1 is a block diagram for showing an apparatus for reproducing and recording MPEG-2 video/audio data according to one embodiment of the present invention.

Referring to FIG. 1, the apparatus includes a link part 110, a multiplexer 120, a buffer 130, a demultiplexer 140, an MPEG decorder 150, a microcomputer 170, and a keyboard 160.

The link part 110 selects a receiving channel according to a tuning control signal generated from the microcomputer 170. The link part 110 decodes a broadcasting signal received through the receiving channel to thereby develop a transport stream which consists of one or more programs multiplexed into a type of a single bitstream, and provides the transport stream to the multiplexer 120.

The multiplexer 120 outputs either the transport stream from the link part 110 or a transport stream from a digital recorder 180 which is illustrated below in detail.

The buffer 130 temporarily stores a transport stream being outputted from the multiplexer 120 and outputs the transport stream to the demultiplexer 140 in response to a control signal from the microcomputer 170.

The demultiplexer 140 demultiplexes the transport stream inputted from the buffer 130 under a control of the

microcomputer 170. The demultiplexer 140 accesses packets relating to a program specific information(hereinafter, referred to as PSI), such as a program association table, a program map table, network information, and a conditional access table, from transport packets of the transport stream. And, the demultiplexer 140 provides the PSI packets to the microcomputer 170. Further, the demultiplexer 140 demultiplexs the transport stream according to PIDs provided from the microcomputer 170, such that each bitstream associated with the PIDs is outputted to the MPEG decoder 150. For example, when a video PID and an audio PID, each of which is associated with a broadcasting program is provided to the demultiplexer 140, the demultiplexer 140 outputs a video transport packet bitstream and an audio transport packet bitstream associated with the video and audio PIDs by demultiplexing the transport stream according to the video and audio PIDs.

The MPEG decoder 150 decodes the single video transport stream and the single audio transport stream from the demultiplexer 140, and generates a video signal and an audio signal. The video and audio signals are outputted to a display apparatus(not shown). According to the present invention, the MPEG decoder 150 detects a sequence header from the video transport stream in decoding the video transport stream, and

outputs the result of whether the sequence header is detected or not to the microcomputer 170.

The keyboard 160 is provided for selecting a broadcasting program or a recording or playback mode. When a broadcasting program or a mode is selected by operating the keyboard 160, the microcomputer 170 is operated in response to signals generated from the keyboard 160.

The microcomputer 170 controls the overall functions of the apparatus in response to the signals generated from the keyboard 160. When a user selects a broadcasting program with the keyboard 160, the microcomputer 170 controls the link part 110 to select a broadcasting channel through which a transport stream including the selected broadcasting program is transmitted based on the program association table(hereinafter, referred to as PAT). And, the microcomputer 170 detects the transport packet PIDs of the selected broadcasting program, that is, a video PID and an audio PID of the selected broadcasting program from the program map table(hereinafter, referred to as PAT), and provides the video PID and the audio PID to the demultiplexer 140.

In the recording mode, the microcomputer 170 encodes video transport packets and audio transport packets to allow the recording apparatus 180 to record the encoded video and audio

transport packets into the storage medium 183 such as a magnetic tape or a hard disk.

In the playback mode, the microcomputer 170 controls the recording apparatus 180 to read out data from the storage medium 183, and controls the multiplexer 120 to output the transport stream inputted from the recording apparatus 180 to the buffer 130. Further, the microcomputer 170 detects PIDs from the transport packets stored in the buffer 130, and provides each of the detected PIDs as a video PID and an audio PID to the demultiplexer 140. The microcomputer 170 determines whether the video PID and the audio PID is correctly set at the demultiplexer 140 according to whether the MPEG decoder 150 detects the sequence header or not. When the MPEG decoder 150 does not detect the sequence header, the microcomputer 170 changes the video PID and the audio PID with each other.

Hereinafter, the operation of the above apparatus will be described with reference to FIGs 2 and 3.

FIG. 2 is a flow chart for showing an operation of the microcomputer 170 depicted in FIG. 1 in a playback mode.

Referring to FIG. 2, when the playback mode is selected, the microcomputer 170 controls the recording apparatus 180 to read out data from the storage medium 183. The data reproduced from a read/writer 181 of the recording apparatus 180 is

outputted to the multiplexer 120. At the same time, the microcomputer 170 controls the multiplexer 120 to output the reproduced data which is of a transport stream form to the buffer 130(ST1).

In step 2, the microcomputer 170 in turn reads out transport packets from the buffer 130(ST2).

In step 3, the microcomputer 170 detects PIDs from the transport packets(ST3).

And, in step 4, the microcomputer 170 determines whether the number of the detected PIDs is equal to a predetermined reference number N or more(ST4).

When the number of the detected PIDs reaches the predetermined reference number N or over, the microcomputer 170 provides the detected PIDs to the demultiplexer 140 as the video and audio PIDs of the transport packets. To the contrary, when the number of the detected PIDs is less than the predetermined reference number N, the microcomputer 170 repeats the operation of steps 2 through 4(ST5).

Hereinafter, the demultiplexing operation of the apparatus depicted in FIG. 1 is illustrated with reference to FIG. 3.

FIG. 3 is a flow chart for illustrating the demultiplexing operation of the microcomputer 170.

Referring to FIG. 3, the microcomputer 170 selects two of

the detected PIDs according to those detected times, and provides the two selected PIDs to the demultiplexer 140 as the video and audio PIDs of the transport packets(ST31).

And, the microcomputer 170 determines whether the MPEG decoder 150 detects a sequence header for a sequence period of the sequence header(ST32, ST33, ST34, ST35).

When the sequence header is detected by the MPEG decoder 150, the microcomputer 170 determines that the two PIDs are correctly set on the demultiplexer 140. To the contrary, when the MPEG decoder 150 does not detect the sequence header for the time-out period T, the microcomputer 170 determines that the setting of the two selected PIDs as the video and audio PIDs on the demuliplexer 140 is incorrectly performed. And, the microcomputer 170 again selects two of the detected PIDs except for the previously selected PIDs, and provides the two again selected PIDs to the demultiplexer 340 as the video and audio PIDsST36).

According to the present embodiment, the apparatus decodes the transport stream read out from a recording apparatus without the information of video and audio PIDs.

FIG. 4 is a block diagram for showing an MPEG-2 video/audio recording apparatus according to another embodiment of the present invention which is connected with a set top box.

As shown in FIG. 4, the MPEG-2 video/audio recording apparatus 400 is connected with the set top box 300 by an interface apparatus 390.

The set top box 330 receives a transport stream consisting of one broadcasting program or more. The set top box 300 outputs video and audio signals of a broadcasting program selected by a user by processing an MPEG-2 broadcasting signal received through an antenna(not shown) or a transport stream reproduced from a recording apparatus such as a DVHS, a DVCR, or HDD.

Conventionally, the set top box 300 includes a link part 410, a multiplexer 320, a demultiplexer 340, an MPEG decoder 350, a first microcomputer 370 and a keyboard 360.

The link part 310 selects a receiving channel according to a tuning control signal generated from the first microcomputer 370. The link part 110 decodes a broadcasting signal received through the receiving channel to thereby develop a transport stream which consists of one or more programs, and provides the transport stream to the multiplexer 320.

The multiplexer 320 outputs either the transport stream from the link part 310 or a transport stream from a digital recorder 400 which is illustrated below in detail.

The demultiplexer 340 demultiplexes the transport stream

inputted from a first buffer 330 of the digital recorder 400 under a control of the first microcomputer 370. The demultiplexer 340 accesses packets relating to a program specific information(hereinafter, referred to as PSI), such as a program association table, a program map table, a network information, and a conditional access table, from transport packets of the transport stream. And, the demultiplexer 340 provides the PSI packets to the first microcomputer 370. Further, the demultiplexer 340 demultiplexes the transport stream according to PIDs provided from the first microcomputer 370, such that each bitstream associated with the PIDs is outputted to the MPEG decoder 350. For example, when a video PID and an audio PID, each of which is associated with a broadcasting program is provided to the demultiplexer 340, the demultiplexer 340 outputs a video transport packet bitstream and an audio transport packet bitstream associated with the video and audio PIDs by demultiplexing the transport stream according to the video and audio PIDs.

The MPEG decoder 350 decodes the single video transport stream and the single audio transport stream from the demultiplexer 340, and generates a video signal and an audio signal. The video and audio signals are outputted to a display apparatus(not shown).

According to the present embodiment, the MPEG decoder 350 detects a sequence header from the video transport stream in decoding the video transport stream, and outputs the result of whether the sequence header is detected or not to the first microcomputer 370.

The keyboard 360 is provided for selecting a broadcasting program or a recording or playback mode. When a broadcasting program or a mode is selected by operating the keyboard 360, the first microcomputer 370 is operated in response to signals generated from the keyboard 360.

The first microcomputer 370 controls the overall functions of the set top box 300 in response to key signals generated from the keyboard 360. When a user selects a broadcasting program with the keyboard 360, the first microcomputer 370 controls the link part 310 to select a broadcasting channel through which a transport stream including the selected broadcasting program is transmitted based on PAT. And, the first microcomputer 370 detects the transport packet PIDs of the selected broadcasting program, that is, a video PID and an audio PID of the selected broadcasting program from PAT, and provides the video PID and the audio PID to the demultiplexer 340.

In a recording mode, the first microcomputer 370 outputs

video and audio transport packets from the demultiplexer 340 to the interface apparatus 390.

In a playback mode, the first microcomputer 370 controls the multiplexer 320 to cause a transport stream inputted through the interface apparatus 390 and generated from the recording appratus 400 to be outputted to the demultiplexer 340. Further, the first microcomputer 380 provides a video PID and an audio PID to the demultiplexer 340, such that the demultiplexer 340 demultiplexes the transport stream. And, the video PID and the audio PID is previously memorized in a memory(not shown) or directly inputted by the keyboard 360.

The interface apparatus 390 provides data from the demultiplexer 340 and the first microcomputer 370 of the set top box 300 to the recording apparatus 400 or data from the recording apparatus 400 to the multiplexer 320 and the first microcomputer 370.

According to the present embodiment, the recording apparatus 400 responds to a mode selection signal generated from the keyboard 390. When the recording mode is selected, the recording apparatus 400 records video and audio transport packets inputted through the interface apparatus 390 on the storage medium thereof. When the playback mode is selected, the recording apparatus 400 reads out data from the storage medium

and outputs the data in a type of transport stream to the interface apparatus 390.

As shown in FIG. 4, the recording apparatus 400 includes a second microcomputer 410, a PID changer 420, a second buffer 430, an encoder 440, a read/writer 450, a decoder 460, and a third buffer 470.

The second microcomputer 410 controls the PID changer 420 and the read/writer 450 in response to the mode selection signal. In the recording mode, the second microcomputer 410 provides the transport stream of the video and audio transport packets which is inputted from the set top box 300 through the interface apparatus 390 to the PID changer 420. At the same time, the second microcomputer 410 outputs a recording instruction signal to the read/writer 450. To the contrary, in the playback mode, the second microcomputer 410 generates a playback instruction signal and provides the playback instruction signal to the read/writer 450.

The PID changer 420 changes PIDs of the video and audio transport packets into predetermined video and audio PIDs, respectively, and outputs the video and audio transport packets of which each of the PIDs is changed to the second buffer 430.

The second buffer 430 buffers the transport packets inputted from the PID changer 420.

The encoder 440 codes a bitstream of the transport packets from the second buffer 430 and outputs an encoded bitstream to the read/writer 450.

The read/writer 450 records the encoded bitstream on the storage medium in response to the recording instruction signal generated from the second microcomputer 410. Further, when the playback instruction signal is inputted to the read/writer 450, the read/writer 450 reads out data from the storage medium and outputs the read data to the decoder 460.

The decoder 460 decodes a bitstream read out by the read/writer 450 to thereby generate the bitstream of the original transport packets and provides the bitstream to the third buffer 470.

The third buffer 470 buffers the bitstream being inputted from the decoder 460 to output the bitstream in the type of transport stream to the interface apparatus 390.

Operations of the receiving apparatus 200 depicted in FIG. 4 will be described below with reference to the flow charts depicted in FIGs. 5 and 6.

FIG. 5 is a flow chart illustrating an operation of the second microcomputer depicted in FIG. 4.

When the recording mode is selected, the second microcomputer 410 detects PIDs from transport packets

continuously inputted from the interface apparatus 390 and in turn provides the detected PIDs to the PID changer 420(ST41, ST42).

The second microcomputer 410 assigns a first predetermined PID to a first transport packet firstly inputted thereto, and provides the first predetermined recording PID to the PID changer 420. At this time, the PID changer 420 changes the PID of the first transport packet into the first predetermined recording PID, and outputs the first transport packet to the second buffer 430. And, when a second transport packet, a PID value of which is different from that of the first transport packet is inputted to the second microcomputer 410, the second microcomputer 410 assigns a second predetermined recording PID to the second transport packet. At this time, the PID changer 420 changes the PID of the second transport packet into the second predetermined recording PID, and outputs the second transport packet to the second buffer 430. Every time that transport packets having the same PID as that of the first transport packet are inputted, the second microcomputer 410 assigns the first predetermined recording PID to the transport packets. And, in case where transport packets having the same PID as that of the second transport packet are inputted, the second microcomputer 410 assigns the second predetermined

recording PID to the transport packets(ST43, ST44, ST45).

The transport packets inputted to the second buffer 430 are outputted to the encoder 440, and recorded on the storage medium by the read/writer 450(ST46).

Therefore, since the transport packets inputted through the interface apparatus 390 to the second microcomputer 410 relate to video or audio transport packets of a single broadcasting program, the recording apparatus 400 stores the transport packets with the first and second predetermined recording PIDs without the types of broadcasting programs.

FIG. 6 is a flow chart for illustrating a playback operation of the first microcomputer 350 depicted in FIG. 4.

Referring to FIG. 6, in a playback mode, the first microcomputer 350 controls the multiplexer 320 to allow a transport stream from the interface apparatus 390 to be inputted to the demultiplexer 340(ST51, ST52).

At the same time, the microcomputer 350 provides the first and second predetermined PIDs as the video and audio PIDs of a program recorded in the recording apparatus 400 to the demultiplexer 340(ST53).

The first microcomputer 370 sets a time-out period T. Preferably, the time-out period T is a sequence period of the sequence header(ST54).

And, the first microcomputer 370 determines whether the MPEG decoder 350 detects the sequence header for the time-out period T. When the sequence header is detected by the MPEG decoder 350, the first microcomputer 370 determines that the setting of the first and second predetermined PIDs by step ST53 is correctly performed(ST55, ST56, ST57).

To the contrary, when the MPEG decoder 350 detects the sequence header for the time-out period T, the first microcomputer 370 determines that the setting of the first and second predetermined recording PIDs by step ST53 is incorrectly performed. And, the first microcomputer 370 again sets the video and audio PIDs on the demultiplexer 340 by changing the first and second predetermined PIDs with each other(ST58).

Therefore, as illustrated above, the set top box(300) reproduces a transport stream of a program inputted from the recording apparatus 400 without the information about how the first and second predetermined recording PIDs are respectively assigned to the video and audio transport packets of the program.

FIG. 7 is a block diagram for showing an apparatus for reproducing and recording MPEG-2 video/audio in which the set top box and the recording apparatus depicted in FIG. 4 are integrally constructed.

At the same portions of FIG. 7 as those of FIG. 4, the same numerals are denoted, and those descriptions are omitted.

In FIG. 7, the PID changer 420 is directly connected with the demultiplexer 340, and the third buffer 470 is also directly connected with the multiplexer 320. A microcomputer 701 performs the same functions as the first and second microcomputers 370 and 410.

While this invention has been particularly shown and described with reference to particular embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be effected therein without departing from the scope of the invention as defined by the appended claims.

CLAIMS

1. An apparatus for reproducing a broadcasting program which is selected from a transport stream, the apparatus comprising:

means for demultiplexing a transport stream according to a video PID and an audio PID, thereby generating a video bitstream of video transport packets and an audio bitstream of audio transport packets representing a selected broadcasting program;

means for decoding the video bitstream and the audio bitstream according to a sequence header, thereby generating a video signal and an audio signal , the sequence header which is detected from the video transport packets or the audio transport packets;

means for recording the video and audio transport packets from the demultiplexing means on a storage medium; and

means for detecting PIDs from the transport stream read out from the recording means providing PIDs and providing the detected PIDs as the video PID or the audio PID to the demultiplexing means in response to whether the decoding means detects the sequence header.

2. An apparatus as claimed in claim 1, wherein said

recording means includes means for generating a first predetermined PID and a second predetermined PID;

means for changing one PID of transport packets with the first predetermined PID and the other PID of the transport packets with the second predetermined PID, respectively, the transport packets in which the video PID and the audio PID are included; and

means for recording PID changed transport packets from the changing means into a storage medium.

3. An apparatus as claimed in claim 1 or 2, further comprising means for buffering the transport stream read out from the recording means, wherein the demultiplexing means demultiplexes the transport stream from the buffering means, and the detecting means detects the video PID and the audio PID from the transport stream.

4. A method of reproducing MPEG-2 video and audio data, the method comprising the steps of:

a) reading out a transport stream of an MPEG-2 broadcasting program from a storage medium in which the MPEG-2 broadcasting program is recorded, wherein the transport stream is multiplexed by video transport packets and audio transport

packets;

b) demultiplexing the transport stream according to a video PID and an audio PID, thereby generating a video bitstream of the video transport packets and an audio bitstream of the audio transport packets;

c) decoding the video bitstream and the audio bitstream according to a sequence header, the sequence header which is included in the video bitstream or the audio bitstream;

d) detecting one PID or more from the transport packets; and

e) selecting the video PID and the audio PID from the one PID or more detected by step d) based on whether the sequence header is detected by step c).

5. A method of recording MPEG-2 video and audio data, the method comprising the steps of:

a) generating predetermined recording PIDs corresponding to each PID of transport packets which are inputted from an exterior;

b) changing each PID of the transport packets into the predetermined recording PIDs, wherein each PID of the transport packets having the same PIDs is changed into the same predetermined recording PID; and

c) recording the transport packets, PIDs of which are changed by step b) on a storage medium.

6. A method as claimed in claim 5, wherein the transport packets are for a single broadcasting program.

7. An apparatus substantially as hereinbefore described with reference to and illustrated by any one of Figures 1 to 7 of the drawings.

8.A method of reproducing MPEG-2 video and audio data substantially as hereinbefore described with reference to and illustrated by any one of Figures 1 to 7 of the drawings.

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Application No: GB 9823408.1
Claims searched: 1-8

Examiner: Ken Long
Date of search: 30 April 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H4P (PPS & PDRX)

Int Cl (Ed.6): H04N (5/00, 7/60 & 7/62)
H04L (5/02 & 12/56)
H04J (3/24)

Other: ONLINE : EPODOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	EP 0782332 A2	SONY	None
A	EP 0751680 A2	MATSUSHITA	None
A	WO 97/46009 A1	THOMSON	None
A	US 5675654	MATSUSHITA	None

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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